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AMC Pamphlet
AMCP 385-81

SAFETY DIGEST

JANUARY 1968

U. S. ARMY MATERIEL COMMAND

GEN. BESSON PRESENTS FY '67 SAFETY AWARDS

Gen. C. W. Eifler, CG MICOM receives the AMC Award of Merit

Gen. W.B. Latta, CG ECOM receives the Award of Merit

FRONT COVER--Gen. Durrenberger, CG Weapons Command is shown receiving the AMC Award of Honor

TO MAJOR SUBORDINATE COMMANDERS

D101.22/3:385-81

Gen. F.G. White, CG MUCOM receives the AMC Commendation

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Gen. L G. Cagwin, CG TECOM receives the AMC Commendation

HEADQUARTERS
UNITED STATES ARMY MATERIEL COMMAND
WASHINGTON, D.C. 20315

AMC Pamphlet 385-81 JANUARY 1968

The Safety Digest is an AMC Pamphlet prepared by the Safety Division, Headquarters, U. S. Army Materiel Command. Its purpose is to disseminate information which can materially influence and improve safety programs at all Command establishments.

Articles are included to supplement technical knowledge as well as practical knowledge gained through experience. They provide a basis for the further refinement of safety measures already incorporated in operating procedures and process layout. To achieve maximum effectiveness, the Safety Digest should be given widespread circulation at each AMC establishment.

Articles appearing in the Safety Digest are unclassified and are not copyrighted. They may be reproduced as desired in order to bring pertinent accident prevention information to the attention of all employees. The Army Materiel Command Safety Digest should be given a credit line when articles are extracted.

Unclassified material believed to be of interest or benefit to other establishments is welcome for publication in the Safety Digest. Please send articles for review to: U. S. Army Materiel Command Field Safety Agency, Charlestown, Indiana. If possible, include pictures, charts, drawings, and illustrations that clarify and heighten interest in your presentation.

(AMCAD-S)

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TEMPORARY MEANS DANGER

C. D. Attaway, Chief Safety Engineer
Thiokol Chemical Corporation
Longhorn Army Ammunition Plant

"Temporary" is defined as "lasting for a short time only."

Sometimes an operation is short term, or a machine or equipment is used for a one-time procedure. In either case, it is temporary -- not forever.

All too often supervisors and workers excuse recognized hazards on the plea of "temporary". They seem to think that because the hazard is going to exist for only a short time it cannot present a danger.

A dangerous condition or hazardous operation cannot be upgraded to SAFE by using the simple excuse that it is "only temporary". An accident caused by a temporary hazard brought about by an unsafe act or condition is just as serious and as costly as any other accident.

If it is necessary to make permanent procedures or conditions as safe as possible, it is equally important to make temporary conditions safe. Perhaps they deserve even more attention, because they usually present one or more known hazards, and temporary conditions tend to become permanent. The temporary electric line is, under normal conditions, replaced when it fails, when an accident occurs, when funds become available, or when the Post Engineer completes the work order. The temporary blocking of an escape door or fire exit is seldom noticed until the alarm is sounded and firemen attempt to enter. The temporary storage of strategic materials or supplies usually continues until shipping instructions are received, standard storage facilities become available or the stacks become unstable. The temporary use of a machine or device without a guard is only corrected after the worker is injured, a safety inspection finding or completion of a work order.

We have no quarrel with temporary work. Sometimes it is necessary. We do object to temporary substandard, unsafe conditions and procedures. The short-time job requires exactly the same safety consideration as the permanent one.

GEN. BESSON PRESENTS AMC SAFETY AWARD TO CG., DESERET TEST CENTER

General Besson is shown presenting the FY 1967 AMC Award of Merit to General Appel, CG, Deseret Test Center during a ceremony at Headquarters, AMC, Washington, D. C.

* * * * * *

NSC Safety Award Notifications

The following AMC elements have been notified that they have won National Safety Council Awards of Honor:

Headquarters, U. S. Army Test and Evaluation Command will receive this coveted award for operating 3,015,468 man-hours without a disabling injury from 1 August 1962 to 30 September 1967.

Anniston Army Depot will receive the NSC Award of Honor for operating 4,485,000 man-hours without a disabling injury from 18 March 1967 to 18 September 1967.

HAZARDS ASSOCIATED WITH USE OF FLUOROCARBON LUBRICANTS

It has been known for over 10 years that fluorocarbon greases and oils can explosively react with aluminum under shear loads. In 1960, a series of tests were conducted using drill tests, that is, a blunt end of a rotating drill with fluorocarbon oil is forcefully pulled down on a piece of aluminum. Other materials tested with aluminum included Kel-F oils and greases, Kel-F powders, and Teflon tapes and powders. No detonations were experienced with Teflons so it may be concluded that under most conditions Teflons would be safe to use. It was also found that explosions do not occur with all types of aluminum and there is evidently a need to determine which alloys produce unfavorable conditions.

At present there are three commercial products which react explosively with aluminum, they are; Fluorolube, Kel-F, and Halocarbon.

At present a new grease, Krytox, is being tested and apparently it will produce a detonation only under extremely severe conditions. It can be concluded that until the mechanism of these detonations is more fully understood no fluorocarbon lubricant should be used with either aluminum or magnesium.

Fluorocarbon oils have been known to explode with aluminum under high shear loads and testing has been done in an attempt to clarify aluminum compatibility.

The laboratory reporting this testing reported that controlled explosions can be obtained by a drill press test. This is to say, a blunt end of a rotating drill having fluorocarbon oil on it, can cause an explosion when forcefully pulled down on a piece of aluminum. Although this test does not simulate service conditions, it is a test method which will select the materials that are more sensitive to shear reactions.

A number of halogenated materials were tested in the above fashion. It is interesting to note that all materials that detonated contain both fluorine and chlorine. It is reported that these materials are all polymers of chlorotrifluoroethylene, although they are marketed under various names. Kel-F, being one of the familiar names, was made to explode in the oil, powder and lip seal form. Teflon, which is polytetrafluoroethylene (a solid containing no chlorine), could not be made to explode. In addition Aroclor 1254, a chlorinated biphenyl used as the liquid carrier in LOX SAFE, NA2-20502, did not explode.

Based on these results it should be safe to use Teflon 30 for Naflex applications since the material should not be exposed to conditions with anywhere near the severity devised in the drill press test.

It is pointed out that the explosions do not occur with all types of aluminum. It isn't known why some of the aluminums do not detonate, but it does indicate that further work is warranted on this type of compatibility study to see if a condition does exist where the teflon could be detonated.

One theory is that the chlorine in the Kel-F material is the instigator of the explosion. Furthermore, the evidence presented here supports this theory. It is reported that a fully fluorinated grease can react with finely divided aluminum at a temperature of about 1200°F, but the same reaction with Kel-F oil occurs at about 425°F. This is explained by the fact that the stronger fluorine bond takes more energy for breakage than the chlorine bond. Moreover, the structure of the molecule apparently plays an important part in the shear reactions. The Aroclor 1254, a chlorinated carbon ring compound, is inert to aluminum in shear testing, yet the straight chained ethylene polymer which contains some chlorine does react.

(Extracted from Armed Services Explosives Safety Board Report PI-38)

* * * * * *

SAFETY SHOE SERVED PURPOSE

Safety Division, Letterkenny Army Depot

An employee was assigned the task of moving 500-pound track guides on a combat type M15A2 trailer so that oil lines could be repaired.

A six-foot long crowbar was utilized to raise the guide so blocking material could be put into place. After raising the guide approximately 18 inches, the bar slipped. This permitted the full weight to drop upon the employee's left foot. The steel cap of the safety shoe was forced down, resulting in only a minor injury to the toe.

Without the protection furnished by the safety shoe the worker might have been a disabling injury statistic. The worker was recommended for membership in the Golden Shoe Club.

Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature (under calm conditions)

Estimated wind speed (in mph)	Actual Thermometer reading (°F.)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT TEMPERATURE (°F.)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-21	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	18	-36	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect)	LITTLE DANGER (for properly clothed person)				INCREASING DANGER			GREAT DANGER				
	Danger from freezing of exposed flesh											

Trenchfoot and immersion foot may occur at any point on this chart

To use the chart, find the estimated or actual wind speed in the left hand column and the actual temperature in degrees F. in the top row. The equivalent temperature is found at the intersection of these two values. The description below the column indicates the danger of frostbite to exposed flesh. For example, with a wind speed of 20 mph and a temperature of +10°F, the equivalent temperature is -25°F. This lies within the zone of increasing danger of frostbite, and protective measures should be taken.

MICROBIOLOGICAL LABORATORY HAZARD OF BEARDED MEN

Manuel S. Barbeito, Charles T. Mathews and Larry A. Taylor
Industrial Health and Safety Office, Fort Detrick

After many years of absence from the laboratory scene, beards are now being worn by some persons working with pathogenic microorganisms.

Previous investigations have shown that common microbiological techniques and accidents may generate a microbial aerosol sufficient to infect man. A literature review revealed that Q fever was transmitted from the microbiological laboratory to persons outside by means of contaminated clothing. There may be other cases of similar indirect transmission. However, there are few reports of direct personal contact in which a healthy microbiological laboratory worker has infected his family or friends outside the laboratory. It has been documented that the source of laboratory infections is unknown in 39 to 86 per cent of the reported cases.

Because of these specific factors, among others, it has been the policy of our laboratories to eliminate as many risks of infection as possible for the laboratory worker and his outside contacts. Since beards reappeared on laboratory workers, and data showed that microbiological techniques created hazards, an investigation was conducted to evaluate the hypothesis that "a bearded man subjects his family and friends to an infectious hazard if his beard is contaminated with infectious microorganisms while he is at work in a microbiological laboratory."

To evaluate the hypothesis, in vitro sampling techniques were used to recover Serratia marcescens organisms and Bacillus var niger spores that had been sprayed onto the 73 day old beards of four volunteers and the shaven faces of five others. (Photo 1.)

Two time intervals, 30 minutes and six hours, were used between spraying and sampling the beard. The 30-minute interval was selected to represent two work situations: (1) the time necessary for a man to complete a laboratory operation in a zealous attempt to avoid loss of an experimental series despite a known accidental contamination of his beard before he rejoined his associates with an unwashed or washed beard; and

(2) the time required for an immediate shower and change of clothing after an accident that contaminated the beard and before association with fellow employees or family. The six-hour interval was selected to represent the time between an unrecognized contamination of the beard and family contact with the unwashed beard.

As a terminal experiment, the beards were sheared and cultured to recover the test organisms.

In vivo contact aerosol transmission was also evaluated by use of a mannequin fitted with a natural hair beard that was contaminated with New Castle Disease virus and subsequently by Clostridium botulinum toxin, Type A. Chickens and guinea pigs were nestled in the beard after a 30-minute contact period following the beard contamination. Both the vitro and in vivo recovery tests were conducted before and after washing the beards and clean-shaven faces with soap containing 2 per cent hexachlorophene.

Results of these studies showed that the non-infectious organisms and spores used by the volunteers were recovered from washed and unwashed beards, from hair shorn before and after washing, and from washed and unwashed clean-shaven faces when microbiological culture recovery techniques were started 30 minutes after the bacteria had been sprayed on the areas.

Both species of bacteria were recovered from unwashed beards six hours after they had been sprayed with the bacteria.

It was also found that more bacteria could be recovered from clean-shaven facial skin than from the attached beard, and more bacteria were washed off the clean-shaven skin during showering than were washed off the attached beards.

Retention of bacteria by the beard was further demonstrated by the finding that more bacteria could be recovered from the unwashed beard hair by shearing and mixing it in a blender with broth, than by recovery techniques used on the attached unwashed beard.

Even after washing, a sufficient amount of virus and toxin were retained on the beard to produce disease upon contact with a suitable host. Although a bearded worker may be protected by vaccination or immunity, an infectious dose is possible for contact aerosol transmission to non-vaccinated associates if the worker is engaged in repetitious operations that produce significant aerosols, or if his beard becomes contaminated as the result of a known accident. A typical repetitious operation would be one on an open bench with

Coxiella burnetii, such as grinding in a mortar, using a blender, decanting a supernatant fluid, or removing a cotton plug from a shaken culture. In this situation, we could conclude that (1) a bearded man is a more dangerous carrier than a clean-shaven man because the beard is more resistant to cleansing; and (2) a person working with infectious microorganisms should wash his beard or clean-shaven face before going home.

From the data obtained in this investigation it is evident that family infection is possible if the beard is contaminated by the etiological agents of such diseases as Q fever, tularemia, Venezuelan equine encephalomyelitis and West Nile fever, for which the inhaled human infectious dose is about 10 microorganisms or animal infective units. (Wedum, A. G., 1964. Public Health Rept. US 79:619-633)

A detailed account of the investigations conducted was published in the July 1967 issue of Applied Microbiology, Volume 15, a publication of the American Society for Microbiology, pp 899-906 by the authors. Permission has been granted by the publication to print above summary.

Techniques for recovering microorganisms from beards. Top row: (left) modified Millipore filter holder; (right) aluminum comb fitted with nonabsorbent cotton, Rodac plate. Bottom row: (left) Calgiswab; (right) physiological saline rinse.

UNION WORKS FOR SAFETY AT TOBYHANNA ARMY DEPOT

Tobyhanna Army Depot was among the first Federal installations to negotiate a union-management contract. Lodge 1647 of the American Federation of Government Employees asked for and received representation on all safety committees and councils as one of the provisions in its yearly union-management contract at the depot.

This union-management sharing of interest in safety has paid off for all concerned. The depot has won three Army Materiel Command awards, five Awards of Honor from the National Safety Council, and numerous State and local awards.

Each repair shop and activity at the depot has a union safety representative. He checks for safety hazards in his activity on a daily basis and calls those he finds to the attention of the post safety officer.

Other recommendations by the union may include such subjects as new areas where safety shoes and safety glasses should be distributed to personnel, or suggestions for improved ventilation.

There are approximately 50 such union representatives throughout the depot.

Joseph Negry, left, union safety representative at Tobyhanna Army Depot, discusses new sign he suggested to alert employees in the carpenter shop to possible hazard, with Raymond Davies, center, post safety officer, and Peter Moses, president of Lodge 1647 of the American Federation of Government Employees.

COMPLIANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS

Safety standards have been developed by the National Highway Safety Agency as a result of the recent Federal legislation concerning highway safety. One of the standards adopted is the Manual on Uniform Traffic Control Devices for Streets and Highways, published by the Bureau of Public Roads, U.S. Department of Commerce. It is a goal of the National Highway Safety Agency that, through the use of this Manual, uniform traffic control devices on all streets and roads throughout the United States will become a reality by 31 December 1968.

The Department of the Army has been requested and has agreed to cooperate in this program. Compliance with the Uniform Traffic Control Manual should not result in major changes at most installations since paragraph 6a, AR 420-72 already requires that all installations within the purview of AR 420-10 conform to the provisions of the Manual. Paragraph 21c, AR 385-55 also requires that Army installations conform to the manual, however, commanders were allowed to utilize traffic control devices adopted by the state in which they are located in the interest of uniformity.

All AMC installations will insure that their traffic control devices conform to the standards of the Manual on Uniform Traffic Control Devices for Streets and Highways by 31 December 1968. The Manual may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402, for $2.00 per copy.

* * * * *

WHEN IS A SAFETY RULE NOT A SAFETY RULE ?

When it is seen -- but not read.

When it is read -- but not applied.

When it is known -- but not obeyed.

When it is deliberately violated.

When it is winked at, sneered at and finally ignored.

When it is not accepted in a spirit of cooperation and sportsmanship.

And, lastly, when, after it has been found important enough to be placed in the rule book, it is not strictly enforced by those who should do so.

- Safety Div., Remington Office Equip. Div., Sperry Rand Corp., La. Army Ammunition Plant

CARBON MONOXIDE : THE INVISIBLE KILLER

The oldest, commonest, and one of the most insidious of all killers encountered in our everyday lives is a destroyer that has existed since man's first discovery of fire.

The killer: carbon monoxide -- chemical formula: CO -- A colorless, orderless, tasteless gas which is a by-product of incomplete combustion of fire.

WHAT IS CARBON MONOXIDE?

To visualize the danger of carbon monoxide more clearly, we must delve a little deeper into just what this gas is, and does.

A description of Carbon Monoxide characterizes it as a poison. This is not exactly correct; for it is more properly described as an asphyxiant. It kills by smothering or asphyxiating. But the "hows and whys" are a little more detailed.

From your high school chemistry, you probably learned that carbon monoxide is a compound of one part carbon with one part oxygen. It is lighter than air; explosive in concentration; and highly toxic.

However, all of us might not have learned that carbon monoxide has an affinity for hemoglobin which is the oxygen-carrying pigment in the blood's red corpuscles. Carbon monoxide combines with hemoglobin at a rate 210 times faster than oxygen combines with hemoglobin. There lies a problem. If there is just a small amount of CO in the air, and this is drawn into the lungs, it will be quickly absorbed into the blood. Since carbon monoxide is rapidly absorbed, oxygen, so necessary to life, will be excluded.

CAR EXHAUSTS CONTAIN CARBON MONOXIDE

Concentrations of carbon monoxide are found in the exhausts of cars. We all expect to find it there. All of us have heard, ever since childhood, of such dangers. Reports of suicides in closed garages, as well as deaths caused by sitting in stalled cars in cold weather, are commonplace. In the latter case, too often, the victim sits in a car with the windows tightly closed and the heater going full blast for warmth. The silent killer then eases its way into the car to act as an executioner.

Everyone has heard of these incidents. But what of the casualties which are caused by the thousand-and-one other producers of carbon monoxide? Casualties which result from coal, wood and fuel oil fires; and all the rest of the combustion processes? They, too, produce carbon monoxide; and can be equally dangerous and lethal.

In addition, it is not infrequent that you read or hear about deaths attributed to asphyxiation caused by exhaust fumes from a gasoline-driven generator; or a maladjusted space heater in a room tightly-sealed against the cold. Even the firing of weapons indoors in a small, poorly ventilated shooting range can be extremely dangerous. While this particular fact sheet was being written, Stars and Stripes carried a story about 15 members of a Mexican wedding party succumbing to a carbon monoxide poisoning. The group was visiting a ranch which lacked sufficient sleeping space and they were bunked temporarily in a room housing a gas-driven generator. Competing for the oxygen in the room, the humans lost out to man's own ingenuity.

DO'S AND DON'TS

Remember that carbon monoxide is indeed an insidious killer - unseen, unheard, undetected, and yet so deadly, and so effective. Follow the rules of common sense.

DON'T: sit in a vehicle with windows closed and motor running.

DON'T: sleep in or near a vehicle with motor running.

DO: have your vehicle exhaust system examined periodically.

REMEMBER: where there is fire there is production of carbon monoxide.

AND REMEMBER: the concentration of CO does not have to be high to be fatal.

- Eighth US Army Command Information Fact Sheet

FORK LIFT SAFETY REQUIRES CONSTANT EFFORT

Some type of fork lift truck is present somewhere in nearly every operation where large quantities of materials must be handled. As a labor saving device, it adds to efficiency and speed of operations.

Materials handling equipment yields maximum benefits when operated by a skillful, attentive worker. If it is improperly operated, the fork lift can offset part of its yield in efficiency by damaging property and injuring personnel. Here are a few of many examples that might be cited as Army Materiel Command experience:

1. An operator using a fork lift without an overhead guard was removing pallets of ammunition from a stack that extended above his seat on the machine. The top pallet fell and struck him on the head. He received a fatal injury. (See Photo 1.)

2. An electric fork lift was backed from a railroad flatcar onto an igloo dock. It was late in the evening and visibility was poor. The operator failed to stop his machine in time to prevent it from running off the dock. The worker jumped clear, but he received a fractured ankle when he hit the ground three feet below. (See Photo 2.)

3. Two workers were transferring batteries from a pallet on a fork lift into a CONEX shipping container. When the container was loaded, one of the men started to move the lift, which was standing on a grade that sloped toward the CONEX. When he released the brake and applied gas to back up the slope, the fork lift rolled forward. It pinned the other worker against the container and fractured his leg.

Most accidents involving materials handling equipment have several common characteristics. What happened is usually clear and easy to understand. In most cases the operator performed a specific act or failed to perform an identifiable act that led to the accident. The accident nearly always should have been easily preventable.

Most accidents that involve materials handling equipment can be prevented by practicing the suggestions listed below. Experience reflected on accident reports has proved that the

most obvious of these common sense rules are frequently ignored:

1. Only qualified and authorized operators should be permitted to operate fork lift trucks. Their training should include instructions in the general mechanisms of the equipment and how it operates. The would-be operator should meet appropriate qualifications of physical ability, sight and hearing. Training should include supervised practice, followed by an examination. Upon completion of the training a license should be issued. (See School for Fork Lift Operators in the May 1967 Safety Digest, AMC Pamphlet 385-77, and Chapter 8, TM 743-200, Storage and Materials Handling.)

2. Only materials handling equipment which is adequately maintained and in good operating condition should be used. The operator should report any defect as soon as he identifies it. He should not operate any equipment which has a defect that could create a hazard for himself, other personnel, the equipment or other property.

3. Forks on moving lift trucks, whether loaded or unloaded, should be raised only enough to clear obstructions. Raising the load raises the center of gravity, increases the danger of capsizing, and causes more damage if the load falls for any reason. It may also interfere with visibility.

4. The driver should face or look in the direction he is moving. Even at its low operating speed, the loaded lift truck may have considerable momentum. Unless a steady eye and hand are used, it may get out of control.

5. The operator should at all times be able to see the driving area ahead of him. If he cannot see over the load, he should operate in reverse, with the load behind him or have a guide directing his movements.

6. Masts of lift trucks tilt backwards, as a precaution against loads slipping off the tines. Lift trucks should be operated in reverse when descending a ramp or incline so that this design safety feature will not be nullified.

7. Corners, cross aisles and exits should be approached with care. The horn should be sounded as a warning. Fork lifts are often relatively quiet machines operated in noisy environments. They can and sometimes do run down and injure pedestrians.

8. A gasoline powered fork lift should never be left unattended while its motor is running. Something might occur to set the machine in motion. Unnecessary carbon monoxide is released to contaminate the working area.

9. Riders should never be transported on a fork lift. It is made to move materials, not persons.

10. Overhead guards should be used, unless a special condition justifies approval to operate temporarily without them. Such occasions should be few, for the operator may then be exposed to blows on his head and body if the load tips back.

11. A wet or slippery floor calls for slower operation. A skidding fork lift endangers operators, machines, load, bystanders and property within collision range.

12. Overloading should not be permitted. It may damage the machine, cause loss of control by the operator, and result in dropped and damaged loads. If the fork lift is so heavily loaded that the driver does not have full control, he has an overload.

13. The operator should use low gear or lowest speed control when he descends a ramp.

14. The operator should brake to a full stop before changing directions.

15. The operator should keep clear of the edges of loading docks. Permitting a fork lift to go over the edge of a platform is one of the most common materials handling equipment accidents.

16. The driver should watch overhead clearance when stacking loads and moving through doorways.

17. The operator should be alert for floor load limits. He should never exceed the load limit of any floor.

18. Sudden stops produce spilled loads.

19. Aisles, roadways, passageways and ramps should be kept free of obstructions and in first class condition.

20. The fuel tank must not be filled when the fork lift motor is running.

A common use of fork lifts is to load and unload trucks and freight cars. Here are things the safe operator will practice:

1. He will make certain bridge plates or dockboards are sufficiently wide and strong to carry the load. If they are damaged he must not use them.

2. He will secure bridge plates and dockboards in position to prevent slipping.

3. He will use dockboards that have turned up sides or an edge plate to prevent the fork lift truck from running over the edge.

4. He will use dockboards that have a high friction surface.

5. He will make certain that the wheels of the vehicle being unloaded are well chocked.

6. He will be certain that the vehicle's brakes are set before he starts to enter it with his fork lift.

7. He will enter and leave freight cars and trucks slowly and carefully.

When such materials handling equipment accidents occur, they almost always reflect discredit on the operator, his supervisor, local safety personnel and the local command. Trained, competent, alert operators have few accidents.

(Editor's Note: Additional information on materials handling equipment safety is available in Chapter 24, AMCR 385-224.)

OVERHEAD GUARDS-FORK LIFT TRUCKS

The following AMC policy on overhead guards is quoted from an AMCAD-SD letter of 17 February 1967, subject: Overhead Guards - Fork Lift Trucks.

"1. References:

"a. TM 743-200, Storage and Materials Handling, paragraphs 4.3.7.3 and 6.0.12 through 6.0.12.3.23.

"b. ASA B56.1, Powered Industrial Trucks.

* * * * *

"2. Safe operating practices ******is stated below:

"a. Fork lift trucks of all types, except 2b below, shall be equipped with overhead guards. Overhead guards will be fabricated of steel and meet the requirements of references 1a and 1b above.

"b. Exceptions are permitted only for fork lift trucks where height of overhead guard would deny entry of truck into work locations or the overhead guard would be lower than top of operator's head. The following operating rules apply to such fork lift trucks not equipped with overhead guards:

"(1) The lift mechanism should be mechanically blocked to preclude lifting any part of the load above the top of the mast, and

"(2) The fork lift truck should be equipped with standard load back rest (vertical package guard) designed in accordance with the pertinent fork lift truck specifications, i.e., MIL-T-21869, MIL-T-21870, etc. These load back rests should not be removed during operations except when facility characteristics, such as curved igloo roofs, prevent the use of the load back rest. Stacking of loads on the fork lift truck tines should be controlled so that no more than 1/3 of the height of the top tier extends above the load back rest.

"3. When the operating rules covered in paragraph 2b cannot be followed and the fork lift truck meeting the requirements of paragraph 2b must be used without overhead guard, a waiver signed by the installation commander must be issued to identify where and under what conditions the fork lift truck may be used."

CURRENT EVENTS

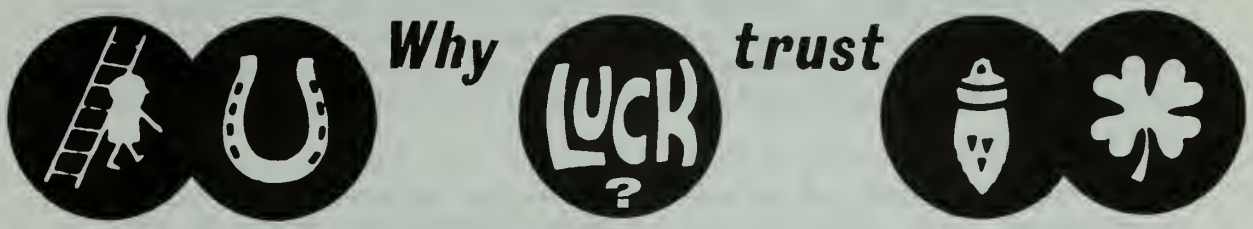
ELECTRIC ERASER CLAIMS VICTIM

A female engineer draftsman was standing at her drafting table sorting overlay forms. A need arose for her to return to her desk, which was located directly behind the table. She turned to her right and started for the desk. As she walked briskly around the end of the table her foot became entangled in an electric eraser cord. She stumbled across the aisle against a file cabinet and fell to the concrete tile covered floor. She received a spiral fracture of the bone in her left upper arm and was expected to be disabled for 60 days.

The electric erasers in the drafting room were mounted in positions that were most convenient to the individual draftsman. The injured woman preferred to have her eraser mounted on the right end of her table. When the eraser was not in use, its cord extended downward in a "U" loop to within eight inches of the floor. It had been used in this location for five years before the cord tripped the user.

To prevent another tripping incident the electric eraser was remounted on the left side of the drafting table, next to the wall. A survey of the other tables revealed that all other electric erasers were already mounted on the table sides nearest the walls.

FOURTEEN YEAR OLD ERROR CATCHES VICTIM



A tank was to be removed from the interior of a long unused manufacturing building. A hole in the roof was made ready, a crane was moved into position, and a load line was dropped through the opening. The line, swivel and a three leg cable spreader were positioned close to the tank. All that remained to be done before the lifting started was to attach the three legs of the cable spreader with standard shackles to three permanently installed lifting eyes on the tank.

The crane operator left the crane and went inside the building to the second floor. In keeping with the plant's "Duties - Crane Operator" he was required to cooperate with and help the lowboy operator, the riggers and related workers. He stood behind an old but apparently securely bolted guardrail at the edge of the floor opening around the tank. He intended to observe and approve the rigging equipment assembly that was to be used, the work location clearance, the securing of the cable spreaders to the tank and to determine that all was ready and safe for the lift.

The employee grasped the guardrail with his right hand and reached out with his left for the cable spreader. To grasp it he leaned against the guardrail. The weight of his body caused the guardrail fastenings to give way progressively beneath him. This caught him off balance, and the yielding rail became a lever. It swung him seven feet out into space before dropping him head first toward the next floor below. His lefthanded grasp on the spreader was too weak to hold him. He fell nine feet.

The employee sustained bilateral fracture dislocations of both elbows and a head injury. He was expected to be away from work for three months.

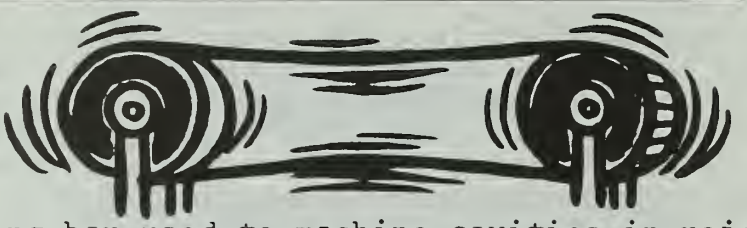
Inspection of the fallen guardrail revealed that bolts in it did not secure the railing header to the floor joist, as they appeared to do. The bolts extended only through the vertical uprights and horizontal lumber of the guardrail. The actual attachment of the guardrail to 2" X 10" floor joists was made with 16d nails.

The building was in a caretaker status. Records for it showed that the latest carpentry work accomplished inside was on a March 1953 work order.

Workers whose duties required them to enter long unused and perhaps severely deteriorated buildings were cautioned to use extreme care in their work. They must determine that such buildings are structurally sound for safe entry.

The accident, its cause and ways to prevent similar accidents were discussed in safety meetings conducted by maintenance personnel. The workers were shown how the guardrail had been fastened. They were instructed never to repair a structure in a manner to give a false impression about its safety.

WORKER CAUGHT BY POLISHING CLOTH



A boring bar used to machine cavities in reject shells was removed from a lathe. The machine was then used to rotate a shell while a workman held a piece of emery cloth against the surface. The contractor employee selected to operate the machine was given instructions on another machine. He was cautioned to use small pieces of the emery cloth for the polishing operation. His reply indicated that he understood this instruction.

Early in his next shift the worker reported to his supervisor that he needed a supply of emery cloth. The foreman issued him a box of emery cloth belts. Recalling the instructions previously given, he did not think it necessary to tell the man to cut the belts into small pieces before using.

The worker took the cloth and went back to his machine. He found the belts were two and one-half inches wide and about 22 inches in diameter. He decided to use them as loops instead of cutting them into pieces. He looped one end round the shell. With his right hand he then applied tension to the belt and with the left hand he applied pressure to the emery cloth on the rotating shell. Eventually he found he could apply pressure with the belt looped over his right forearm.

After nine and a half hours on duty a hazard inherent in the procedure overtook the worker. The chuck and shell rotated in excess of 1200 RPM's. During one of the polishing operations the emery cloth grabbed on the rotating surface and began to wind about the shell. The speed was so great that the worker had no time to remove his right arm from the loop. His arm was pulled against the rotating shell. The belt then broke and released the arm.

Both bones in the worker's right forearm were fractured. Some muscle tissue was lost. Lacerations to his forehead required sutures.

The contractor took action to prevent recurrence of discrepancies revealed by the accident:

1. A piece of equipment had been altered to perform an operation for which it was not intended. A safety tag procedure had been violated through failure to notify the plant Safety Department.

2. Other pieces of equipment had been set up and approved for use in polishing operations. These should have been used instead of the makeshift unauthorized operation. As a result of the injury all hand polishing operations were discontinued.

OMITTED STEP CAUSED ELECTRICAL EXPLOSION

Two employees of a heavy industrial electrical section were sent to a compressor room to energize a 4160 volt circuit that served an air compressor motor. The 125 HP motor had been rewound by a contractor and reinstalled. A rotation check was to be performed before a permanent connection of the motor leads was made.

At the compressor room the two employees checked to make certain that the leads to the repaired motor had been connected. The "hold" tag was then removed. One of the workers then pressed the starter switch button to "bump" or "jog" the motor.

The starter switch contacts arced and smoke began to come from the starter cubicle. The arcing current could not be interrupted by opening the starter switch. Before

the 4160 volt service could be de-energized, three 50 amp fused disconnects and a lightning arrestor on the overhead to an underground structure exploded. This structure was located in a parking lot. Flying hot fuse metal, porcelain fragments and lightning arrestor parts struck and damaged six parked privately-owned automobiles. No personnel were injured.

An investigation disclosed that the insulating oil housing surrounding the starter contacts had been lowered. This had been done to permit instrument checking of circuit to motor leads and the power supply circuit. The side panel of the starter cubicle had then been replaced without reassembling the lowered oil container. This left the starter contacts exposed in air and provided a grounded metal surface (the oil container) very close to the contacts.

When the switch contacts were energized at 4160 volts arcing occurred to ground and between phases. This ground and phase-to-phase fault caused the fused disconnects on the parking lot structure to fail.

The following actions were taken to prevent similar accidents:

1. The policy relating to "hold" tag removal was re-emphasized. Whenever possible, only personnel placing "hold" tags would remove them. If it became necessary for any employee to remove another's "hold" tag he would assure that all conditions were safe before energizing any circuit or equipment.

2. Supervisors would assure that only qualified personnel perform work on high-voltage equipment, unless such work was checked by a competent electrician.

3. When two or more employees were assigned to a job, one would be made responsible for safety checking the work.

4. The employee responsible for leaving the insulating oil container off the starter contacts was emphatically instructed that in no event would equipment operating in insulating oil ever be left in an unprotected condition.

5. The Post Engineer directly charged the Chief of the Utilities Division with personal responsibility for assuring these policies were disseminated and enforced.

YOU WOULD THINK IT COULD NEVER HAPPEN

The driver of the last truck in an Army convoy recognized a piece of lumber that fell from the truck ahead of him. It was a 1" X 6" X 1' oak board, tapered on one edge for use at the foot of the ramp of a transport aircraft. Use of the board allowed the handling wheels of helicopters to climb upon the ramp.

The driver stopped, recovered the board and placed it on top of the other materiels on the floor of his cab. These items included a tool box of hand tools, a cardboard box of clothes and shoes, and a suitcase.

Nearly 20 miles down the road the driver reduced speed when he approached a detour around a road construction area. When he again pressed the accelerator to maintain his slower speed, he discovered it was stuck. He gave it a sharp kick to break it loose. The accelerator did depress and immediately stuck again in a wide open position.

The startled driver glanced down and discovered that the oak board he had picked up had worked across the cab floor and was binding the accelerator. He also realized that his truck was gaining speed rapidly and was coming much too close to the automobile just ahead.

Trying to avoid a rear-end collision, he applied the air brakes. The change in speed caused the board to shift again and to become entangled with both the brake and the accelerator pedals. Still trying to stop the truck, the driver applied the trailer brakes with the hand control on the steering column. This did not suffice to regain control.

The truck went into a skid, moved across the center of the highway and collided head-on with an approaching automobile. The tractor and the automobile were completely demolished. The Army driver was disabled with broken ribs, a sprained ankle and shock. Three members of one family, passengers in the car, were killed, and a fourth was seriously injured.

The installation reinstructed all vehicle operators that loose materials were not to be transported in cabs if there was a possibility that these might become involved in the vehicle controls.

FORETHOUGHT YEILDS HAND PROTECTION

The part of the worker's body most often exposed to possible injury is his hand. In his work he uses it constantly to grasp, manipulate, push, pull and touch an endless variety of tools and products. Opportunities for injuries are infinite, and actual injuries frequently occur. Most of these are minor in nature. When a more severe injury is experienced, the usefulness of the complex hand is likely to be permanently impaired to some extent.

In any sound safety program much attention must be given to measures that will protect the hands and fingers of workers. Forethought and vigorous action can do much to reduce the number and severity of injuries.

These photographs show a few of the measures that have been taken to protect the hands and fingers of workers at the Sunflower Army Ammunition Plant. The individuals shown in the pictures are employees of Hercules Inc., the operating contractor at the installation.

Photo 1 - A rectangular metal casing houses the moving blade of a band saw in a carpenter shop.

Photo 2 - A shield covers the cutting blade of a jointer. The worker obtains additional protection for his hands by using a wooden push tool to move a board into place.

Photo 3 - A shield covers the edge of this high speed saw, except for the area where contact is made with the board that is to be cut. In addition to hand and finger protection, the shield guides sawdust and splinters away from the worker.

Photo 4 - The blade of a table saw is protected by a heavy duty plastic shield designed to protect the hands of the carpenter as he cuts lumber.

Photo 5 - The moving blades of an air fan can severely damage fingers. A shield keeps hands away and permits air to be moved freely.

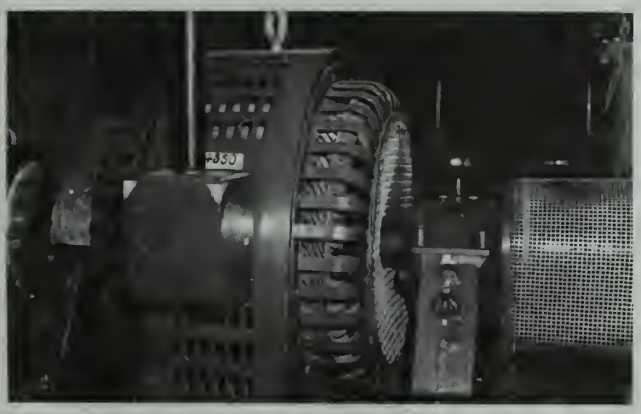


Photo 6 - Screens over pulleys and gears and heavy metal bars over armature protect against high revolutions per minute electric motors.

Photo 7 - Heavy plastic gloves, plastic sleeves, vest and hood provide protection for a maintenance worker in an area where acids are present.

SAFETY IN PYROTECHNIC MANUFACTURE

W. C. McCay
Safety Director, Longhorn Army Ammunition Plant

In recent years the manufacture of pyrotechnic items for military use has taken on a new importance as a result of the Southeast Asia engagement. New items in the pyrotechnic family have been required to combat an enemy in a new and challenging environment. Existing items have had to be modified to meet the specific needs. Production rates have soared from a few thousand units per month for a single item to a requirement of 100,000 units and upward per month.

With few exceptions the pyrotechnic items required in previous years were provided by private contractors at privately owned plants. Because of competitive bidding, low quantity demand, and uncertainty as to length of contract, these private contractors were often unable to provide facilities and equipment necessary for high production rates. Demands were not great enough for the Department of Defense to provide special facilities that could produce the items at a high rate of production similar to that required for conventional ammunition.

Early in 1963 the picture began to change. Longhorn Army Ammunition Plant was selected as the site for production of the M-125 series of hand signals. The Plant is a Government-owned,

contractor-operated facility with Thiokol Chemical Corporation as the operating contractor. Part of a facility constructed in 1951 for the manufacture of a pyrotechnic item (M-120 photoflash bomb) was reactivated for manufacturing hand signals. By early spring 1965 the Plant was requested to convert and reactivate additional facilities for manufacturing 105mm and 155mm illuminating projectiles and 4.2-inch illuminating mortar cartridges. Immediately upon going into production of these items, schedules and capability rates were increased to requirements similar in quantities to that of conventional ammunition. Other items were added in fast succession, including the 60mm and 81mm illuminating mortar cartridges, AN/ALA-17 flare, and XM40 anti-intrusion button bomblet.

To meet the desired schedule rates for these items, the operating contractor (with the aid of outside vendors) had to design new automatic and semi-automatic equipment, to convert existing machines and tools, and to replace obsolete equipment used in the pyrotechnic industry. New methods and procedures had to be conceived, approved and put into use.

Safety had to be integrated into the developing mass production pyrotechnic manufacturing industry. Some of the experience gained should be useful in other areas of explosives manufacturing and processing.

The material Longhorn Army Ammunition Plant uses for flash shields is an example of these. In pyrotechnic production it is necessary to have a transparent material with high temperature and impact resistance and tensile strength. Several plastic companies are now producing a polycarbonate sheet that will meet this requirement. One of the first uses for this material was the face shield used by astronaut White in his space walk. It must be emphasized that this material is to be used as flash shields and not for operational shielding purposes.

Picatinny Arsenal conducted tests of the material to determine its adequacy for protection against flash fires. (Editor's Note: See the article, "Test of Polycarbonate Sheets for Use in Face Masks", in the March 1966 Safety Digest.)

The following information is extracted from correspondence received by Longhorn Army Ammunition Plant from Picatinny Arsenal:

a. Polycarbonate sheets of different thicknesses were procured to perform tests to determine the adequacy for use in asbestos hoods.

b. Although these sheets of polycarbonate were not put into hoods due to their shape, they were subjected to the flame of a fast burning pyrotechnic composition. The sheets used for this test were .080 and .093 inch in thickness. They were placed under a wooden box at about the same distance from the powder that an operator would be while working with this material. The test was actually more severe than would be experienced during a manufacturing operation. The weather was windy and the flames were blown directly against the sheets.

c. The sheets were extensively charred and received several slight, fine cracks but remained intact. From results of the tests conducted on polycarbonate, it was concluded that this material was substantially adequate for protection against a severe flash fire and that it might be used in asbestos hoods and possibly nitrometer masks. The cost of polycarbonate is comparable to cellulose acetate when procured in the sheets. Sheets one-fourth inch thick cost approximately $2 per pound.

Photos 1 through 5 show examples of the use of this material in the Longhorn Army Ammunition pyrotechnic production.

Sheets of material procured for our use are 4' x 8' x 1/4" and can be sawed, machined or bent into desired shapes. The tensile strength of the material will average 8,500 PSI at room temperature. Even at 250°F., when many other thermoplastics are formless masses, a one-eighth inch thick sheet will still exhibit a tensile strength of 6,000 PSI. Average Izod impact strength of 14 foot pounds per inch of notch is exhibited by one-eighth inch thick specimens. This means that a sheet only 5/16 inch thick will bounce off a .22 caliber long rifle slug fired at 19 feet; a .38 caliber from 15 feet; and a .45 caliber from 50 feet. An untinted sheet of the material has a luminous transmittance of 86 per cent in a one-eighth inch thickness. This compares to 92 per cent for glass.

Additional safety has been achieved in the mixing operation. In this operation there is always danger of the mixing blades coming in contact with the bowl surface or some foreign object becoming entrapped underneath the mixer blade and causing undue friction between the mixer bowl and the object. To combat this hazard in the operation of our Simpson-Muller type mixers for illuminant compositions, the operating contractor has attached a teflon wiper to the leading edge of the blades with zero clearance between the teflon and bottom and side of the bowl. The blade section that wipes the center shaft is also equipped with teflon.

The one-fourth inch thick teflon is attached to the blade with rivets and a metal strip for reinforcement. The teflon extends approximately one inch beyond the blade edge, thus permitting greater clearance to be maintained between the metal blade and the bowl. This modification, in addition to the clearance factor, assures a better mixing of all materials and leaves the mixer cleaner after dumping. (See Photos 6 and 7.)

Use of non-flammable material for cleaning mixers is another safety feature. Acetone has been a prominent cleaning agent in the pyrotechnic industry for several years. Several fatalities were experienced in the industry from using acetone in cleaning mixers. Through a series of tests the operating contractor at Longhorn has found that two substances - methylene chloride or phosphate ester mixed in proportions with sawdust provides an excellent solution for cleaning mixers that are contaminated with pyrotechnic materials. (See Photo 8.) Such proportional mixing should insure complete wetting of the sawdust.

Methylene chloride is preferred over other materials because of the economic factor. A mixture of the solution is put into the mixer and the mixer is operated for approximately 10 minutes, dumped, rinsed with water and wiped down with a rag dampened with acetone. The fact that the blades are equipped with the teflon wiper makes cleaning easier as only a small amount of residue is left in the mixer after the mixing cycle.

Although the optimum level of safety may not yet have been reached in mass production of military pyrotechnic items, much has been accomplished. The lessons and new process information learned should be put into practice whenever these may be beneficial.

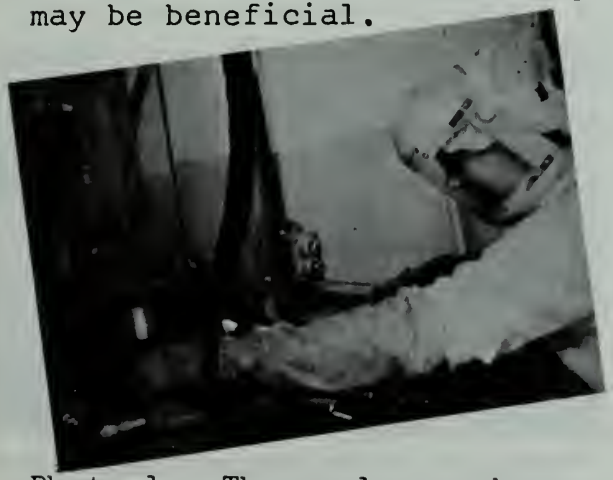


Photo 1 - The employee shown is wearing a polycarbonate face mask during a pyrotechnic manufacturing operation.

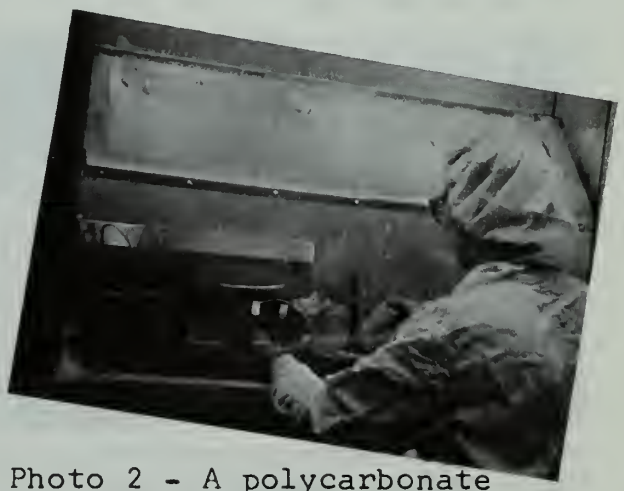


Photo 2 - A polycarbonate sheet placed around a manufacturing operation protects the operator in the event of a flash or explosion.

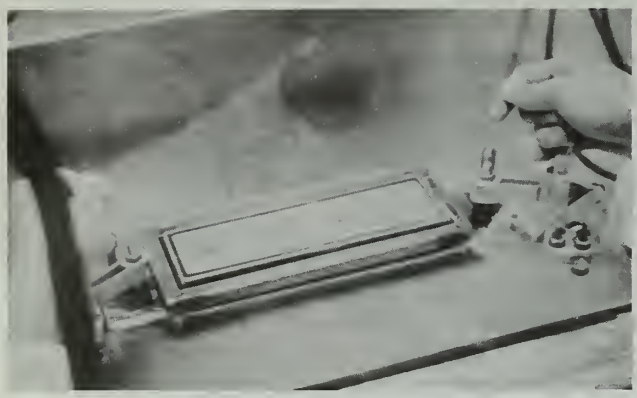


Photo 3 - Only the operator's hands are exposed to pyrotechnic items as the work is performed behind a polycarbonate sheet.

Photo 4 - Booths in a pyrotechnic production line are separated by sheets of polycarbonate.

Photos 6 and 7 - A strip of teflon attached to the mixer blades assures better mixing of materials and leaves the mixer cleaner after dumping.

Photo 5 - Workers perform their duties behind a protective polycarbonate shield and a face mask.

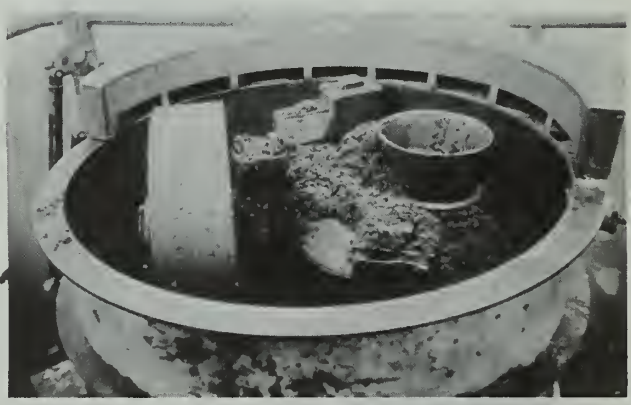


Photo 8 - Portions of methylene chloride and phosphate ester mixed with sawdust make an excellent solution for cleaning mixers contaminated with pyrotechnic materials.

BARRICADE TESTS

Three barricade tests were conducted recently at Red River Army Depot to determine whether the design of locally fabricated steel barricades would afford adequate protection to operating personnel during ammunition inspection, disassembly, and transfer operations.

Test No. 1

This test had a two-fold purpose. The first was to determine whether propagation would occur between boxes of hazardous fuzes during transfer by motor vehicle should a fuze detonate and second, would a steel, sand-filled barricade afford adequate protection to personnel operating the motor vehicle?

Details of Barricade. The top, ends and sides were 7 gage sheet steel. Framing was fabricated of 2 x 2 x 3/16 inch angle iron. Four bottom supports were fabricated from shallow 3-inch channel iron. All framing, bracing and channels were secured to the 7 gage sheet steel by tack welds. After filling the barricade with sand, a metal cover was bolted to the top of the barricade. Over-all barricade dimensions were 80 inches long x 31-3/8 inches wide x 39 inches high.

Test Procedures, Results, and Conclusion. The barricade was then placed crossways in a salvage dump truck body which had been positioned on raised steel supports approximately four feet above the ground. Both sides of the truck bed were lined with mild steel plate one inch thick. These liners were secured to each end of the barricade with a continuous fillet weld.

Three rows of four boxes, each box containing thirty (30) M572 fuzes with M21A4 boosters (total 360 fuzes with boosters) were then placed side-to-side within the truck bed on a three-layer mat of rubberized hair. Spacing between the rows of boxes ranged from approximately 4 to 6 inches.

The initiating material consisting of a No. 8 blasting cap, 0.6 pound of Composition C was attached to a M21A4 booster and the assembly placed in a fiber container which was then centrally positioned on one of the boxes of fuzes within the truck body and detonated. Subsequent to the initial detonation, seven other intermittent detonations were audibly discernible. The cushioning material (rubberized hair) was found to support combustion and was destroyed by fire which resulted from the detonation.

Examination of the results of the test indicated that most of the boosters burned and detonated low order. Approximately 5% were duds. The majority of the fuzes remained in the truck bed although a few were projected from the truck bed to the immediate surrounding area.

Examination of the barricade and truck bed disclosed several indentations in the side of the barricade adjacent to the explosives; there were no penetrations of the metal. Based upon the test results, it was concluded that mass detonation of the fuzes would not occur and, that the barricade would protect the motor vehicle operator against the explosive force effect of 360 M524 fuzes should a fuze detonate while being transported as in the test configuration to the demolition area for destruction.

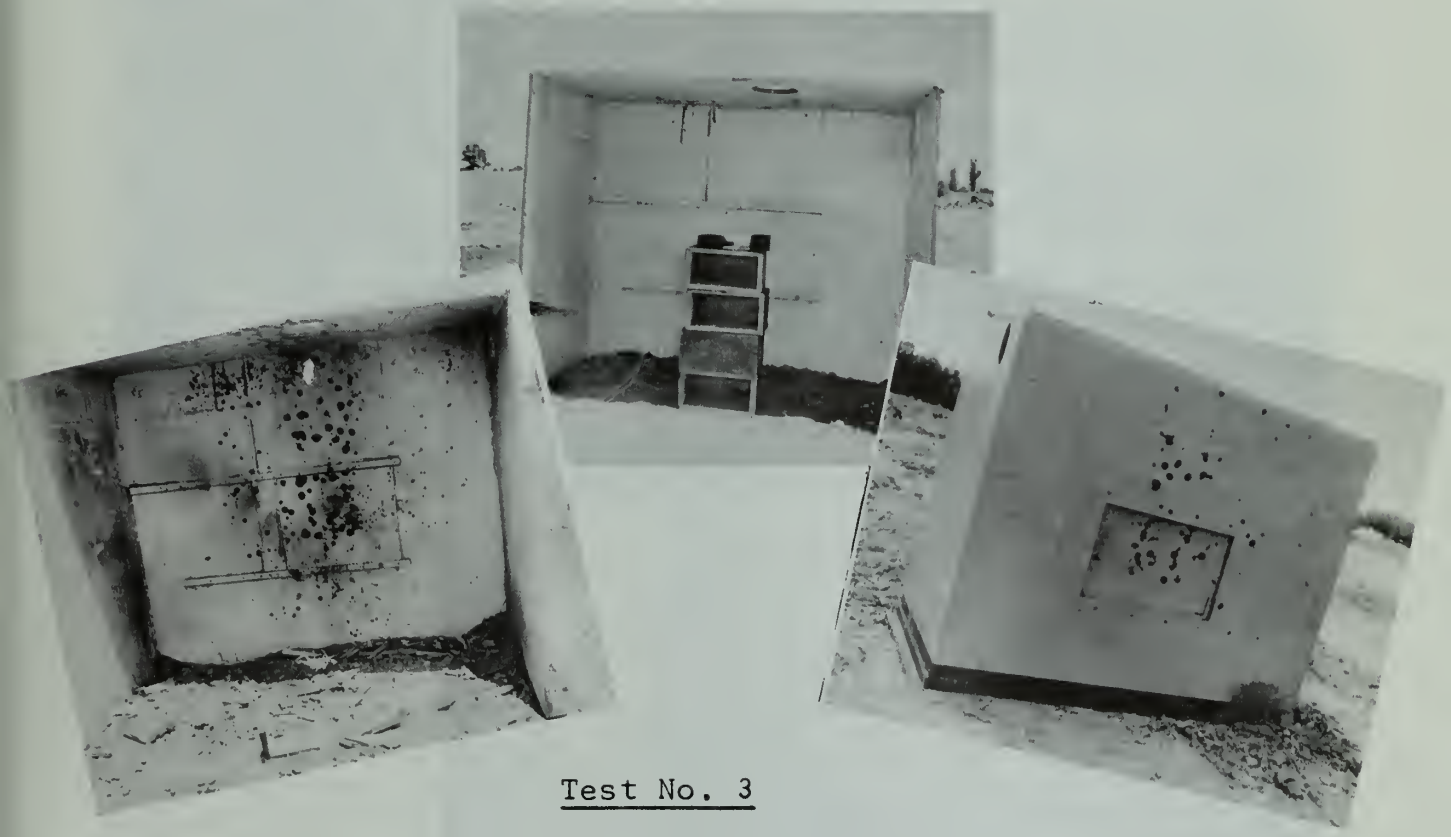
Test No. 2

The purpose of this test was to determine whether a locally designed barricade would afford adequate operator protection during a remote control disassembly operation involving an 81MM M362 mortar round with fuze PD M524.

Details of Barricade. Constructed of 1 inch mild steel, the completed barricade measured 96 inches long x 48 inches wide x 78 inches high. Continuous welds were used at all seams and joints, both internally and externally.

Test Procedures, Results and Conclusion. An 81MM M362 mortar round containing 2.29 pounds of HE plus a 25% overload or .57 pound of Composition C, making a total explosive weight of 2.86 pounds, was used. The mortar was then placed on a support constructed of wood boxes. The distance between the round, the barricade, and the ground was three feet. Detonation of the round was then accomplished with an electric blasting cap.

Examination of the barricade indicated fragments did not penetrate; however, points of fragment impact were readily apparent upon examination of the exterior of the barricade. Based upon the results of the test, it was concluded that the barricade was adequate for use during disassembly of an 81MM M362 mortar round with fuze PD M524.



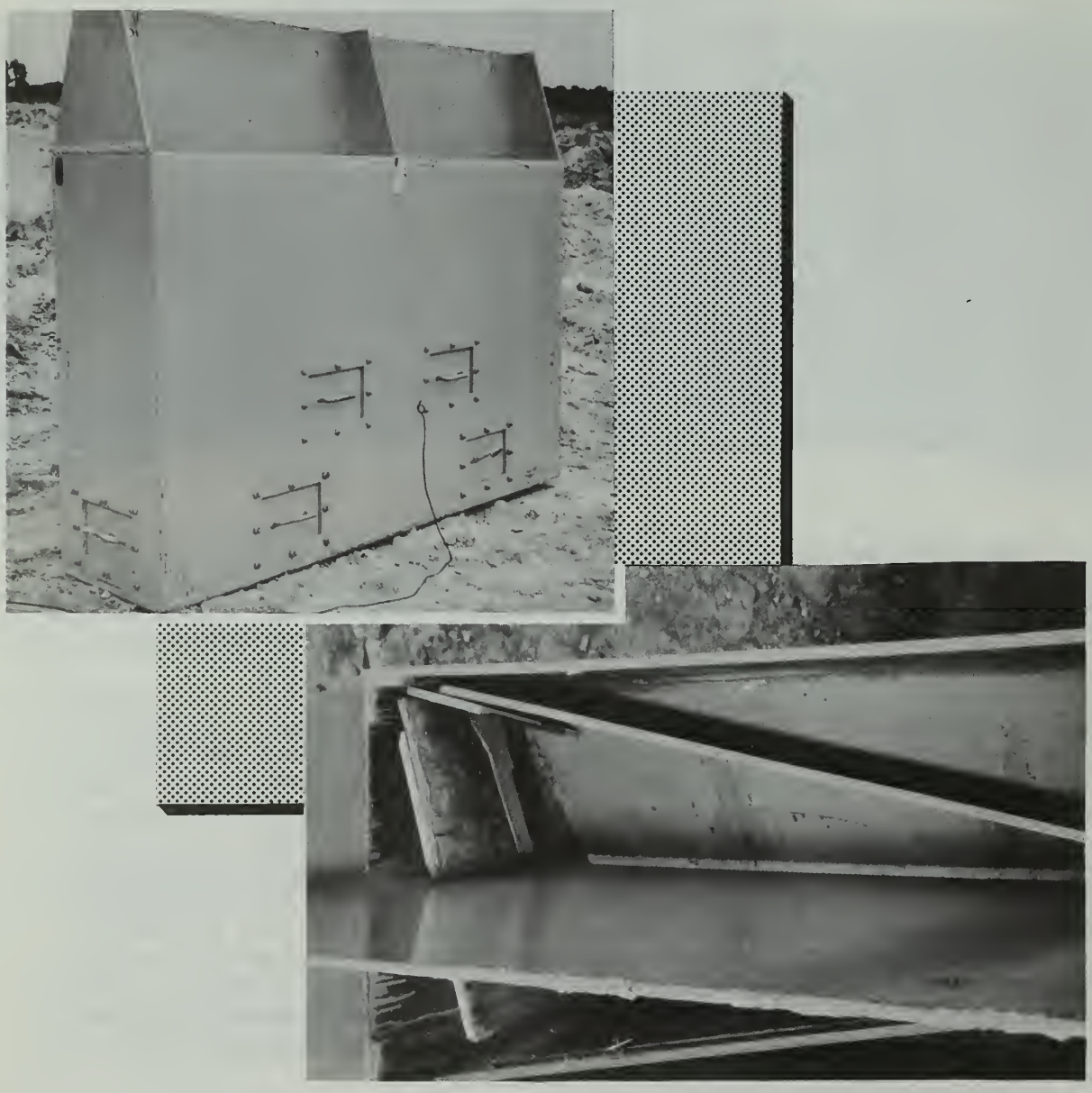
Test No. 3

The purpose of this test was to determine whether a grenade "pitch-in" barricade other than the standard APE 1213 would afford adequate protection to operating personnel in the event an M-26 grenade was tossed in the barricade and detonated.

Details of Barricade. Constructed of 5/8 inch thick mild steel plate and lined with 1/2 inch thick plywood. A center dividing partition was installed which extended three feet above the top of the barricade. Three 5/8 inch thick baffles were installed which alternately extended downward 30 degrees from the horizontal and past center, and separated the bottom of the barricade from the top. A V-shaped false bottom fabricated of 8 gage sheet metal was installed which was designed to retain a grenade approximately 8 inches from the bottom of the barricade. All interior and exterior welds were continuous. Over-all dimensions of the barricade were 8 feet long, 2 feet wide and 5 feet high. Inspection ports were provided in the ends and both sides of the barricade above and below the false bottom.

Test Procedures, Results, and Conclusion. An inspection port was opened and one M26 hand grenade with 25% Composition C overload was positioned inside the barricade on the false bottom approximately equidistant from the ends of the barricade. The inspection port was then closed and the grenade detonated with an electric blasting cap.

Examination of the barricade revealed that the only damage was a hole blown in the 8 gage metal which formed the false bottom, and dislocation of the plywood liner. No welded surfaces or area of steel plate including the bottom showed any indication of failure or penetration. It was therefore concluded that the barricade afforded adequate protection against the explosive force of an M26 hand grenade.



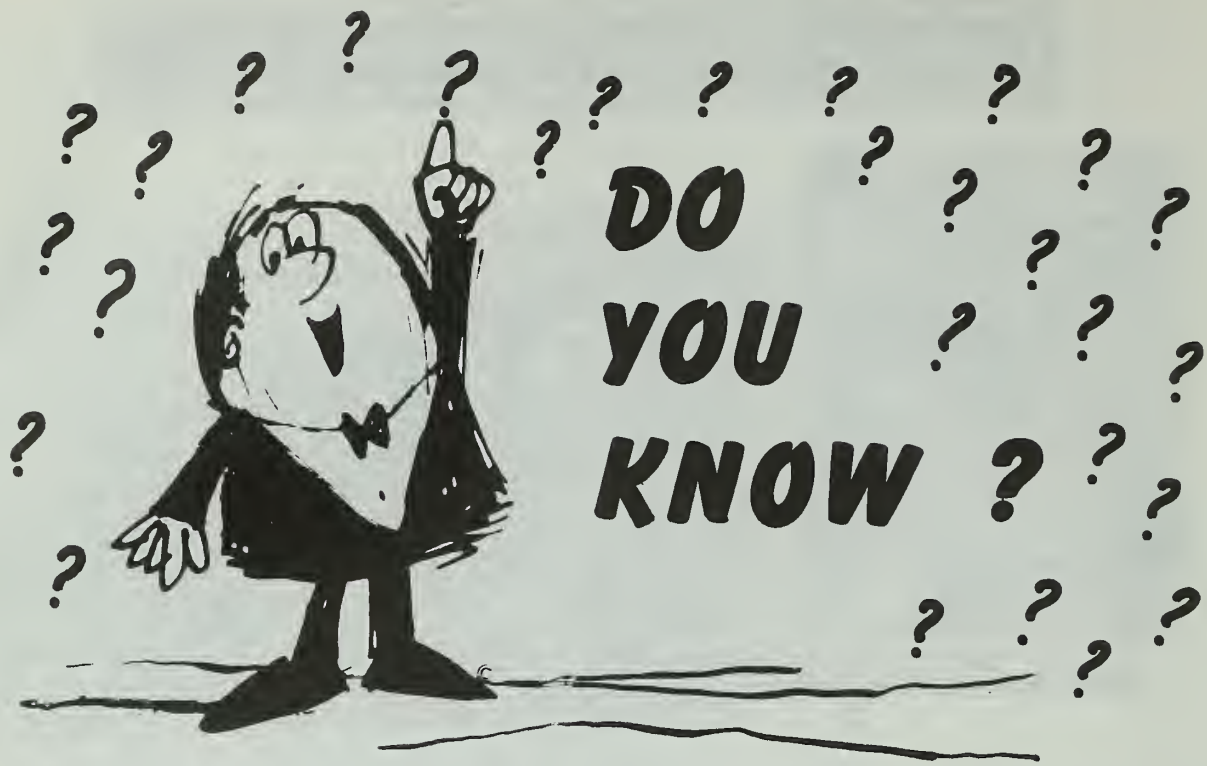
EXPLOSION DEMONSTRATES DIVIDING WALL VALUE

An explosion at an AMC installation provided this clear demonstration of the protective value of substantial dividing walls. M-30 propellant was undergoing normal processing. The press had been charged with approximately 115 pounds of propellant, and extrusion through the press die plate started. A press shot occurred. No one was injured, but the press and one bay of the building were damaged. Photo 1 shows in dramatic fashion that the substantial dividing wall prevented any propagation of the explosion and most damage to the adjoining bay. Photo 2 shows how the seven other bays in the building remained relatively undisturbed.

* * * * * * *

SACREMENTO AD WINS AMC COMMENDATION FOR SAFETY

Photo shows Maj. Gen. Lang, Chief of Staff, presenting the AMC Commendation for Safety to Col. John E. Maier, OO, Sacramento Army Depot during a ceremony at Headquarters, AMC, Washington, D. C.



Here are 10 questions that will test your knowledge of safety requirements that you will need under different circumstances. The answers to all of them may be found in AMCR 385-224. How many can you answer without referring to the regulation? The correct answers and references appear on pages 40 and 41.

1. Persons in the open are considered safe from the blast effect of an explosion, when separated by what distance from the explosion site?

   Answer and reference:

2. Does the erection of barricades constitute an effective means by which quantity-distance requirements may be reduced for classification yards through which railcars containing ammunition and explosives are handled?

3. Provided all pertinent explosives quantity-distance separations are complied with, what is the maximum quantity of Class 7 material permitted at any one loading dock?

   Answer and reference:

4. In machine drilling of explosives by use of multiple drills, what is the required operator protection standard?

   Answer and reference:

5. When crews are working in aboveground storage magazines containing explosives, how many separate work crews are allowed in the magazine at any one time?

   Answer and reference:

6. May ammunition and explosives in damaged containers be stored in the same magazine with ammunition in servicable containers?

   Answer and reference:

7. Is it permissible for a worker to wear an eye shield made of nitrocellulose?

   Answer and reference:

8. May women be employed in all "toxic" operations performed by men?

   Answer and reference:

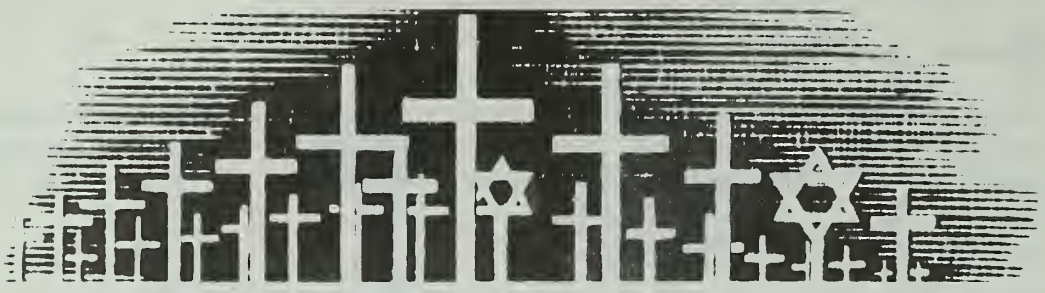
9. What common chemical compound is suitable for neutralizing large quantities of spilled acid?

   Answer and reference:

10. Should an exterior fire escape be located adjacent to windows?

    Answer and reference:

TREE TRUNK TRAGEDY



The top of a large tree had broken off during a recent storm, leaving some 12 feet of the trunk standing. A base ground maintenance crew was assigned to dig up the roots and then call for a tractor and driver to pull the tree out of the ground. The tractor arrived as requested, but it turned out that the driver had been licensed for less than two weeks and was obviously something of a novice at this type of task.

When the roots had been loosened, the team chief took over the tractor but was unable to move the stump. The team chief was then called away. He told the crew to keep working on the roots, and instructed the driver to stand by in case he was needed.

After more roots had been cut, the neophyte driver took over. He moved the tractor out about 15 feet from the tree and attached the tow chain to an accessory mounting bracket under the driver's seat. He hadn't bothered to use a drawbar, although the instructions in the tractor manual and a placard located on the driver's seat both contained a warning that all hitches for trailer-type equipment must be attached to a swinging drawbar and not to the trailer.

The operator fired up the tractor and attempted to pull the tree stump forward. As might be expected, the front wheels of the tractor lifted off the ground. The front end jerked upward and overturned in an arc around the rear axle. The driver was pinned under the tractor, and his injuries proved fatal.

Who can be blamed for what appeared to be a deliberate disregard of published instructions? The investigators agreed that personnel error on the part of the driver was the primary cause. But supervisory error was named a contributing cause, in that the team chief did not supervise the job being done by an inexperienced driver, and improper procedures and inadequate equipment were being used on what turned out to be a dangerous project.

The tractor operating instructions were expanded to include more information on vehicle limitations, all operators were re-briefed on the drawbar requirement, and supervisors were directed to maintain at the site of all future work projects to make sure that the work is safely and properly done.

(Reprinted from United States Air Force Aerospace Maintenance Safety magazine.)

Reference Publications

AR 11-8, 8 September 1967
Army Programs, Logistics Policies and Procedures.

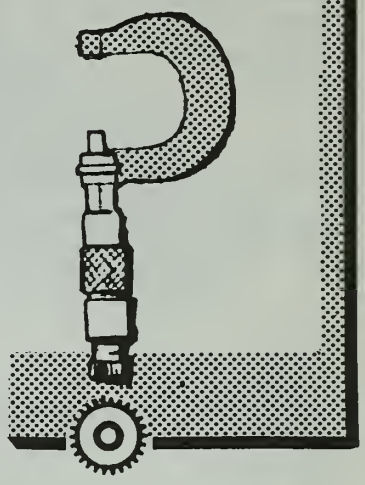
AR 360-5, 27 September 1967
Army Information, General Policies.

DA Circular 40-41, 25 September 1967
Medical Service, Malaria Chemoprophylaxis for Vietnam Returnees.

DA Circular 350-47, 26 October 1967
Training, Army Medical Service Professional Postgraduate Short Course Program - Fiscal Year 1968.

DA Circular 385-18, 21 September 1967
Safety, Training for Army Safety Personnel.

AMCR 740-13, 3 October 1967
Storage and Shipment of Supplies and Equipment, Preparation of Outloading and Storage Drawings for Ammunition Explosives and Guided Missile Ground Support Equipment.



WELL,

Did you know

Here are the answers to the questions on pages 36 and 37 . All questions were based on information contained in AMCR 385-224. A reference to the pertinent paragraph follows each answer.

1. A person in the open is considered to be safe from the blast effect of an explosion when he is separated from the explosion site by a distance equal to one-half the public highway distance. At this distance he is not considered to be safe from missiles. Reference paragraph 1704.

2. No. Barricades will not be interposed for the purpose of reducing these distances. Reference paragraph 1713.

3. The quantity of class 7 explosives on one dock shall not exceed 250,000 pounds, after compliance with all explosives quantity-distance separations. Reference paragraph 1717b.

4. Operations involving the use of multiple drills or drills one-fourth inch or less in diameter must be performed by remote control, with operator protected by an operational shield. Reference paragraph 2615c.

5. The number of crews working in a magazine may not exceed the number of exits. Reference paragraph 1806d.

6. No. Damaged containers should be repaired or the contents transferred to new or serviceable containers before storing in a magazine with ammunition in serviceable containers. Reference paragraph 1808.

7. Goggles and eye shields must not be made of nitrocellulose or other highly flammable materials. Reference paragraph 1008.

8. Women may be employed at any "toxic" operations that are safe for men. There is no satisfactory evidence that women are more susceptible than men to chemical intoxication. Reference paragraph 1104a.

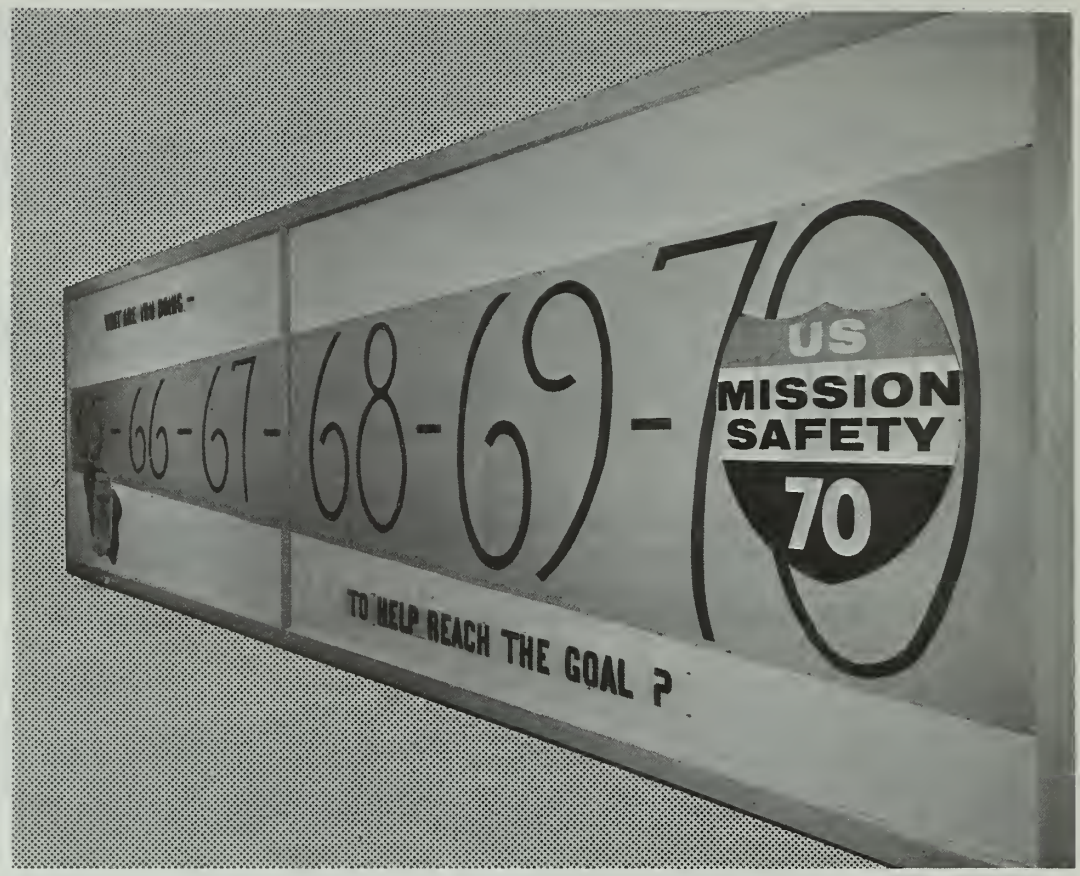
9. Slaked (hydrated) lime is used for neutralizing large quantities of spilled acid. Reference paragraph 1303f.

10. An exterior fire escape should be located at a section of the wall that does not contain windows. Reference paragraph 510b.

SAFETY MANAGEMENT INTERN TRAINING PROGRAM ENTERS THIRD YEAR

The U. S. Army Materiel Command Safety Management Intern Training Program is now in its third year. A full class of ten carefully selected Safety Assistants is receiving six months of training at the AMC Field Safety Agency. The next three months will be used to gain on-the-ground familiarity with the different types of AMC installations. They will then leave AMC Field Safety Agency for three months on-the-job training at the separate installations to which the class members will be permanently assigned.

The trainees shown left to right in the above photo are (first row) Jody D. Meredith, George S. Dow, John Q. Watkins, Raymond D. Layne, Raymond G. Finney; (second row) Lawrence E. Smith, Malcolm H. Faust, Robert K. Wilson, Roger A. Clark and Edward P. Moran.



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